User manual for the MODBUS TCP INTERFACE on LTMs and multi bypasses

UPS/NTA GB/MODBUS TCP MTC.A

15/02/2007

FOREWORD

We thank you for the trust you have in the Uninterruptible Power Systems and LTMs/Bypasses designed by Socomec Sicon.

This equipment is fitted with up to date technology and power semiconductors (IGBT) including a digital micro-controller.

Our equipment complies with standard IEC EN 62040-2.

CAUTION: "This is a product for restricted sales distribution to informed partners. Installation restrictions or additional measures may be needed to prevent disturbances".

SOCOMEC SICON UPS reserves the right to make any changes to data without prior notice.

SAFETY REQUIREMENTS

Using conditions:

Do read carefully this manual before using.
Whatever the repairs, they must be made only by authorised staffs which have been suitably trained.

Reference to the using of the LTM

Respect the safety requirements.
Do read carefully the operating instructions of the LTM/Bypass prior to any intervention.
For an optimal operation, it is recommended to maintain the ambient temperature and humidity of the UPS environment below the values specified by the manufacturer.

This equipment meets the requirements of the European directives applied to this product. As a consequence, it is labelled as follows:

CE

ENVIRONMENT CONCERNED REGULATION

Recycling of electrical products and equipment

Provision is made in European countries to break up and recycle materials making up the system. The various components must be disposed of in accordance with the legal provisions in force in the country where the system is installed.

1. INTRODUCTION

General

The LTM/BYPASS range of SOCOMEC SICON proposes an interface of *MODBUS TCP* type for direct connection of LTMs/BYPASSES systems to the Ethernet network.
This manual describes the features of the connection as well as the data available through the network.

Ethernet Interface

The interface proposes 2 types of connection:
- the « real port »mode, for which the host detects the communication as a standard serial port.
- the full TCP mode as per specifications « *modbus-ida* ».

This document does not describe the way the MODBUS TCP protocol is managed. For further details, please visit the official website www.modbus-ida.org. A summary of IDA specifications can be found at the end of the document.

The MODBUS TCP protocol for ***LTM/BYP***A**SS** equipment uses *Input Registers* -3- with a 16 bit coding for data reading and *Write single Registers -6-* for LTM management.

The data field is composed of words with a most significant byte (MSB) and a less significant byte (LSB) read as follows:

DATA (WORD)	
MSB	LSB
b_7 b_0	b_7 b_0
b_{15}	b_0

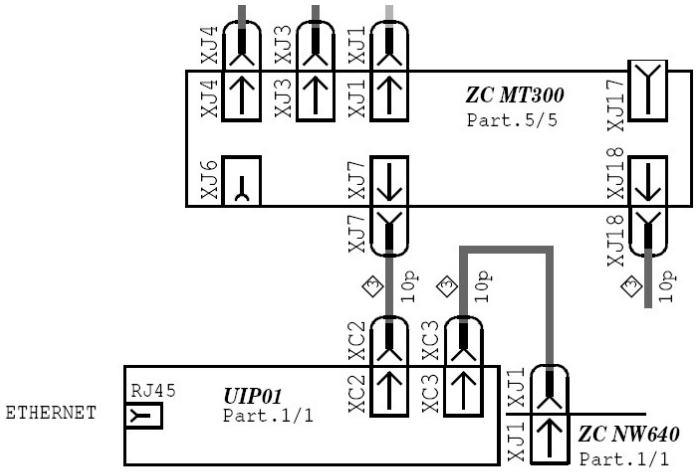
Data decoding

Binary data
They consist of the status and alarms of the LTM. Each bit of each word corresponds to a data. When set at 1 in a word, the bit means the status or alarm is active.

Analogue data (measurement and counter data)
They consist of a 16-bit word. Some values are expressed in decimals bearing a sign or not (i.e. 0 to 65535 or -32767 to 32767) or in hexadecimal coding (0x0000 to 0xFFFF).

2. INSTALLATION OF THE MODBUS TCP PCB

Layout diagram



Installation of the MODBUS TCP interface

The interface has been integrated to the electronic system of the LTM/BYPASS. The integration depends on the range of LTM/BYPASS systems (DIN support, on a sheet metal panel…).

The Ethernet connector RJ45 is intended for the connection to the network.

Setting by default of the serial connection (compulsory step)

Baudrate:	9600 bauds
Parity:	none
Data:	8 bits
Stop:	1 bit
Slave:	1

The parameters of the serial connection can be programmed from the control panel. **If this function can not be accessed, default parameters are then used**.

⚠ The connection must be set as conditions mentioned above. If need be, the configuration can be modified through the user interface.

Configuration screen of the control panel

F1 F2 F3 F4

The activation of the serial connection is programmed by the Servicing department during the LTM/BYPASS commissioning or PCB installation. (SOCOMEC SUPERVISOR DEVICE set at NO)

Description of LEDs

Yellow LED RJ45:	ON:	Line detected
	Blinking:	Searching line
	OFF:	No Ethernet line
Green LED RJ45:	ON:	
	OFF:	No traffic
	Blinking:	MODBUS TCP Traffic
Interface green LED TX	ON:	when transmitting data
Interface green LED RX	ON:	when receiving data
LED 5V iso	Interface live	

Features

IEEE 802.3
10/100Base-T
10/100Mbps (auto sensing)
mode Half-duplex & Full-duplex (auto sensing)
RJ-45

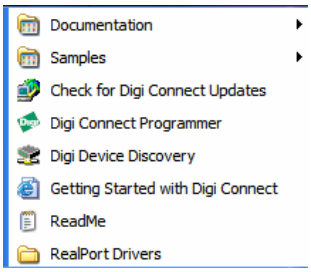
3. DEFAULT SETTING OF THE MODBUS TCP INTERFACE

Default setting

DHCP mode by default. No IP address set by default
Mode MODBUS TCP
Port TCP 502

Configuration software

Configuration tools are to be installed on a PC with WINDOWS. The setup programme is on the CD provided with the interface. A new programme group has been created.



Searching the LTMs connected to the Ethernet

The utility program « *Digi Device Discovery* » is for viewing the IP and MAC addresses of each LTM.

Accessing http pages

Data related to connection and module setting can be accessed using the web interface. The « home page » can be opened either by means of the « *Discovery* » utility or the Internet browser by selecting the IP address indicated by the « *Discovery* »utility.
Access to pages is protected by a « login » and a password.
Login by default: `root`
Password: `dbps`

Downloading firmware

By default the module is programmed with the firmware for the MODBUS TCP function.
In case of « real port » mode, the firmware on the CD must first be downloaded.

For any other configurations, please refer to the DIGI® manual available on the CD.

4. MODBUS TCP DATA MAP FOR LTM/BYPASS systems

General data map of MODBUS TCP input frames

§	Description	Start address Hexa	Start address Decimal	Length of the data map in words	JBUS function
1	Status and alarms	0x0000	0	16	3 for reading
2	Measurements	0x0010	16	64	3 for reading
3	Controls	0x0040	64	1word/control	6 for writing

How to read data:
The status and alarms map must be read thoroughly (start address and length of data map).
The measurement data map can be addressed word by word or by set of words, but without exceeding the length of the map (from 0x0000 to 0x003F).

Incoming data structure:

example of 6 words											
1	2	3	4	5	6	7	8	9	10	11	12
MSB 0	LSB 0	MSB 1	LSB 1	MSB 2	LSB 2	MSB 3	LSB 3	MSB 4	LSB 4	MSB 5	LSB 5
WORD 0		WORD 1		WORD 2		WORD 3		WORD 4		WORD 5	
b_{15}	b_0	b_{15}	b_0	b_{15}	b_0	b_{15}	b_0	b_{15}	b_0	b_{15}	b_0
D15	D00										
M00		M01		M02		M03		M04		M05	

MODBUS TCP data map of status and alarms

Each word is explained bit by bit.

0000h : Status Source 1

D0:	Load on source 1	D8:	Not used
D1:	Static Switch (CS) 1 closed	D9:	Not used
D2:	Load on maintenance bypass 1	D10:	Not used
D3:	Reserved	D11:	Not used
D4:	Source 1 out of tolerances	D12:	Not used
D5:	Source 1 absent	D13:	Not used
D6:	Q41 closed	D14:	Not used
D7:	Not used	D15:	Not used

0001h : Status Source 2

D0:	Load on source 2	D8:	Not used
D1:	Static Switch (CS) 2 closed	D9:	Not used
D2:	Load on maintenance bypass 2	D10:	Not used
D3:	Reserved	D11:	Not used
D4:	Source 2 out of tolerances	D12:	Not used
D5:	Source 2 absent	D13:	Not used
D6:	Q42 closed	D14:	Not used
D7:	Not used	D15:	Not used

0002h : Output status

D0:	Source 1 preferred	D8:	Output out of tolerances
D1:	Q30 closed	D9:	Output absent
D2:	Load on preferred source	D10:	Not used
D3:	Load on alternate source	D11:	Not used
D4:	CS of preferred source closed	D12:	Not used
D5:	CS of alternate source closed	D13:	Not used
D6:	Load not supplied	D14:	Not used
D7:	Sources synchronised	D15:	Not used

0003h : General status

D0:	Transfer in progress	D8:	Not used
D1:	Not used	D9:	Not used
D2:	Not used	D10:	Not used
D3:	Not used	D11:	Reserved
D4:	Not used	D12:	Reserved
D5:	Not used	D13:	Remote mode
D6:	Not used	D14:	Reserved
D7:	Not used	D15:	Reserved

0004h : Alarms

D0:	Imminent stop	D8:	Alarm CS2
D1:	Detection Icc (short circuit current)	D9:	Electronic alarm
D2:	Transfer locked	D10:	Not used
D3:	Transfer impossible	D11:	Not used
D4:	Return impossible	D12:	Not used
D5:	Maintenance bypass alarm (Q5x and Q30 closed)	D13:	Not used
		D14:	Not used
D6:	Overload	D15:	General alarm
D7:	Alarm CS1		

0005h : Faults 1

D0:	Preventive alarm temperature CS1	D8:	Reserved
D1:	Temperature CS1	D9:	Output voltage sensor
D2:	Reserved	D10:	Electronic temperature
D3:	Power supply Driver CS1	D11:	Not used
D4:	Ventilation CS1 (if option provided)	D12:	Not used
D5:	Reserved	D13:	Standard power supply
D6:	Phase rotation source 1	D14:	Input supply 1
D7:	Critical overload CS1	D15:	Input supply 2

0006h : Faults 2

D0:	Preventive alarm temperature CS2	D8:	Reserved
D1:	Temperature CS2	D9:	Not used
D2:	Reserved	D10:	Not used
D3:	Power supply driver CS2	D11:	Not used
D4:	Ventilation CS2 (if option provided)	D12:	Not used
D5:	Reserved	D13:	Optional power supply (if option provided)
D6:	Phase rotation source 2		
D7:	Critical overload CS2	D14:	Power supply MT610 (if option provided)
		D15:	Reserved

0007h : Controls enabled

D0:	Reserved	D8:	Remote/local mode
D1:	Reserved	D9:	Not used
D2:	Reserved	D10:	Not used
D3:	Reserved	D11:	Not used
D4:	Reserved	D12:	Not used
D5:	Reserved	D13:	Not used
D6:	Reserved	D14:	Not used
D7:	Reserved	D15:	Not used

0008h to 000Fh: Not used

MODBUS TCP data map of measurements

0010h	phase to phase voltage U13 source 1	Volts	
0011h	phase to phase voltage U21 source 1	Volts	
0012h	phase to phase voltage U32 source 1	Volts	
0013h	Frequency source 1	Hz x 100	example: 4993 = 49,93Hz
0014h	output voltage V1	Volts	
0015h	output voltage V2	Volts	
0016h	output voltage V3	Volts	
0017h	load rate	%	example: 51 = 51Hz
0018h	crest factor	x10	example: 14 = 1,4
0019h	Frequency source	Hz x 100	example: 4993 = 49,93Hz
001Ah	Reserved		
001Bh	Reserved		
001Ch	Reserved		
001Dh	Reserved		
001Eh	Reserved		
001Fh	Reserved		
0020h	phase to phase voltage U13 source 2	Volts	
0021h	phase to phase voltage U21 source 2	Volts	
0022h	phase to phase voltage U32 source 2	Volts	
0023h	Frequency source 2	Hz x 100	example: 4993 = 49,93Hz
0024h	output current phase 1	Amperes	
0025h	output current phase 2	Amperes	
0026h	output current phase 3	Amperes	
0027h	Phase shift source 1 and source 2	µ second	
0028h	Electronic temperature	°C	
0029h	Output power - phase L1	kVA	
002Ah	Output Power - phase L2	kVA	
002Bh	Output Power - phase L3	kVA	
002Ch	Reserved		
002Dh	Reserved		
002Eh	Reserved		
002Fh	Reserved		

0030h to **003**Fh: Not used

MODBUS TCP data map of controls

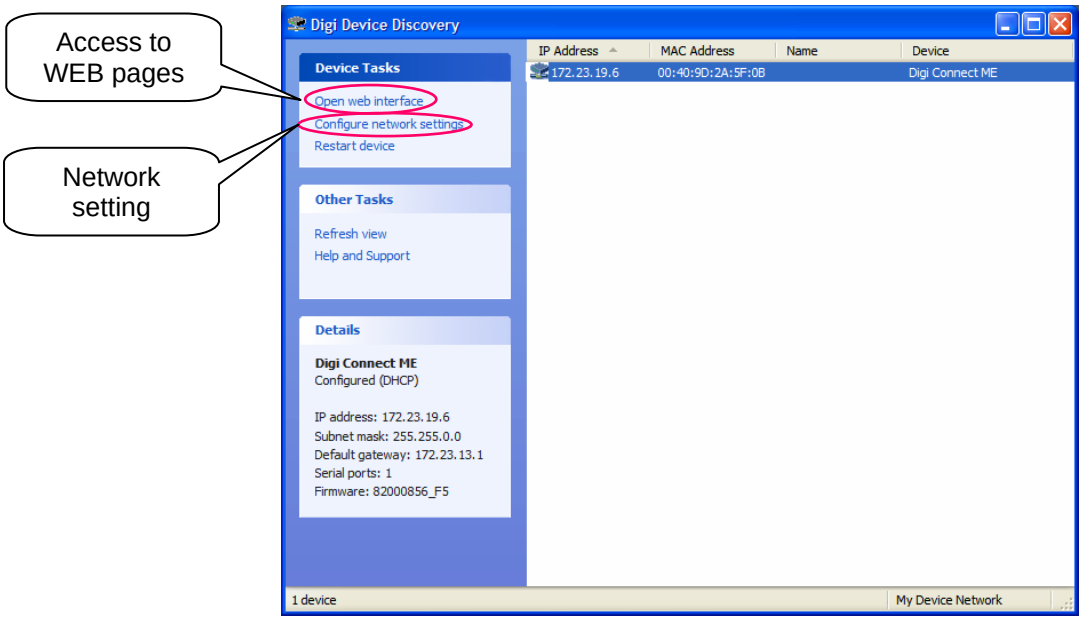
Each control corresponds to an address. Write value « 1 » at the corresponding address to activate the control.

0040h : Closing of CS on preferred source
0041h : Closing of CS on alternate source
0042h : Closing CS1
0043h : Closing CS2
0044h : Load stop
0045h : Alarm reset
0046h : Transfer locked
0047h : Source 1 preferred
0048h : Source 2 preferred
0049h : Reserved
004Ah : Reserved
004Bh : Reserved
004Ch : Reserved
004Dh : Reserved
004Eh : Reserved
004Fh : Reserved

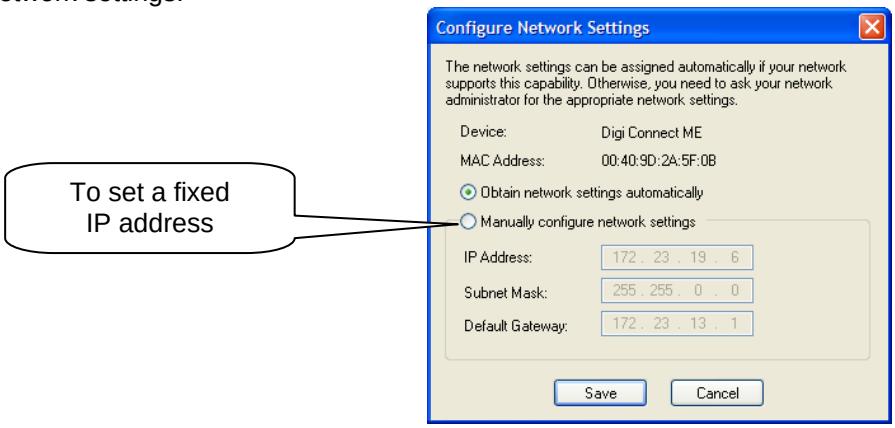
NOTE: A value different from zero at the address activates the control.

ANNEXE 1: SETTING OF THE INTERFACE USING DIGI DEVICE DICOVERY©[1]

Searching the LTMs connected to the Ethernet

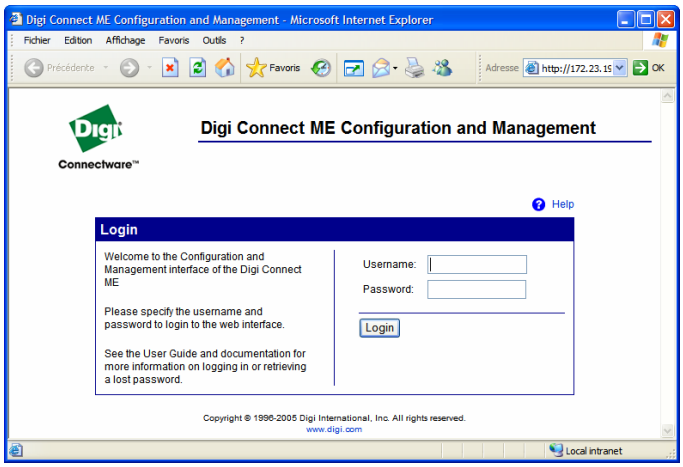


Network settings:


To set a fixed IP address
Configure Network Settings
The network settings can be assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate network settings.
Device:
Digi Connect ME
MAC Address:
00:40:9D:2A:5F:0B
Obtain network settings automatically
Manually configure network settings
IP Address:
172 . 23 . 19 . 6
Subnet Mask:
255 . 255 . 0 . 0
Default Gateway:
172 . 23 . 13 . 1
Save
Cancel

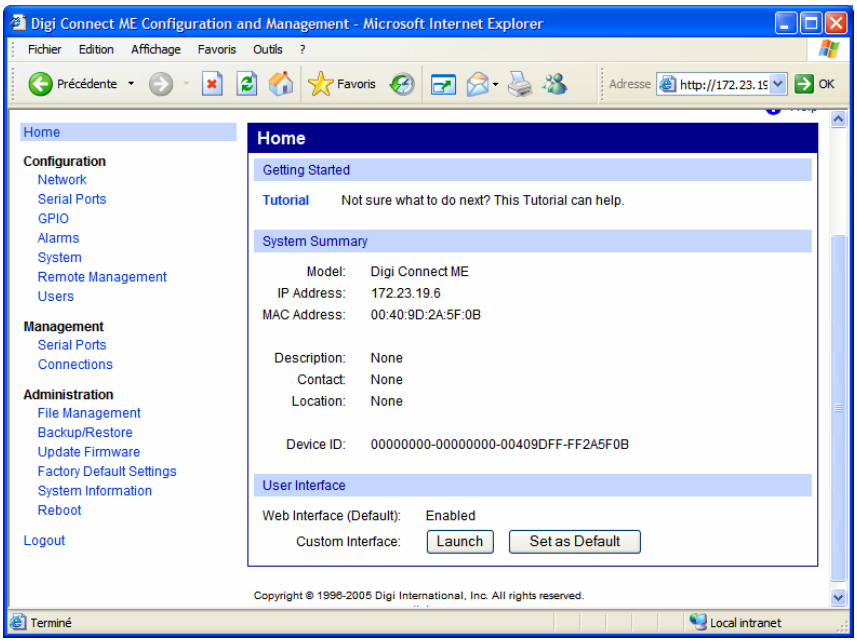
[1] Digi is a registered brand.

Access to HTTP pages

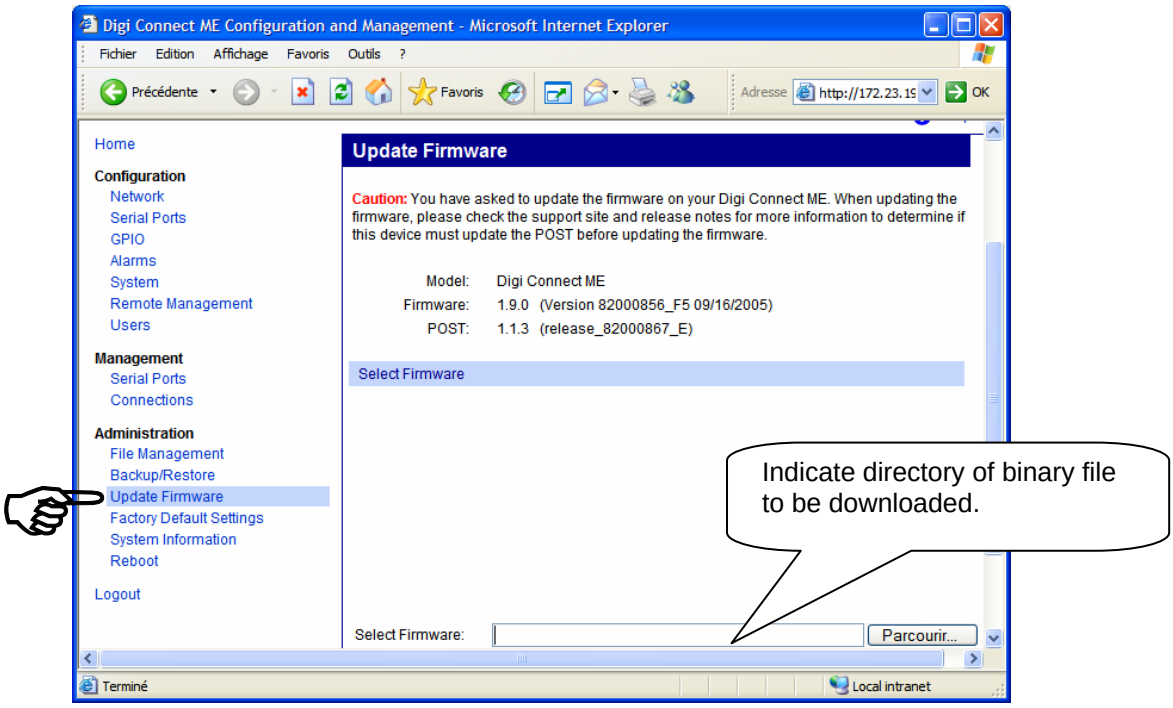

Digi Connect ME Configuration and Management - Microsoft Internet Explorer
Digi Connect ME Configuration and Management
Connectware™
Help
Login
Welcome to the Configuration and Management interface of the Digi Connect ME
Please specify the username and password to login to the web interface.
See the User Guide and documentation for more information on logging in or retrieving a lost password.
Username:
Password:
Login
Copyright © 1996-2005 Digi International, Inc. All rights reserved.
www.digi.com
Local intranet

Login: `root`
Password: `dbps`

Home Page:



Updating of the firmware:



Version of firmware:

MODBUS TCP: 82001164.bin
REAL PORT: 82000856_F5.bin

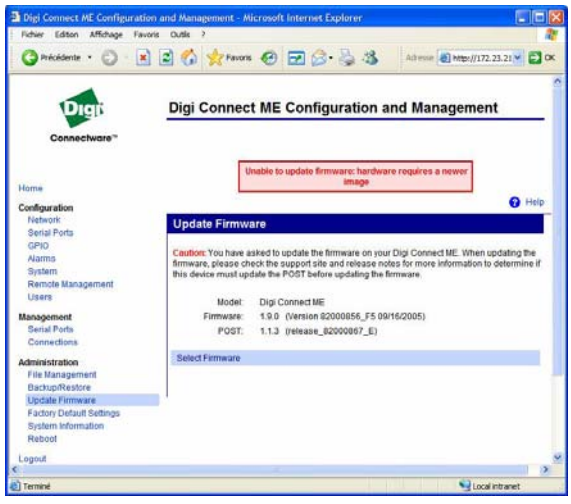
Click on Update

Help opens an on-line help window and a link to DIGI site if necessary.

After completing the downloading process, click on Reboot.
Wait for at least 1 minute before trying to access the interface.

Problem during downloading process:

If the following screen appears during downloading, it is necessary to download the POST version of the firmware (available on the CD) as well as the firmware.


Digi Connect ME Configuration and Management
Unable to update firmware: hardware requires a newer image
Update Firmware

ANNEXE 2: MODBUS TCP IDA specification

The JBUS frames below are only examples:

REQUEST BY MASTER IN JBUS/MODBUS RTU MODE

Original frame: 01 03 1034 0003 40C5
Encapsulated frame: **0046 0000 0006** 01 03 1034 0003

where:

0046 corresponds to the transaction number
0000 corresponds to the protocol identifier
0006 corresponds to the number of bytes (length of the message)

Note:

The CRC is suppressed in the encapsulated JBus frame.

REPLY OF MTC IN JBUS/MODBUS RTU MODE

Original frame: 01 03 06 0002 0184 0000 1960
Encapsulated frame: **0046 0000 0009** 01 03 06 0002 0184 0000

where:

0046 corresponds to the transaction number
0000 corresponds to the protocol identifier
0009 corresponds to the number of bytes (length of the message)

Note:

The CRC is suppressed in the encapsulated JBus frame.